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TITLE: TDVC-to-MELP transcoder

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PARENT-CASE:

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 09/822,503 filed Apr. 2, 2001 ("Compressed Domain Universal Transcoder"), the disclosure of which is incorporated herein in its entirety.

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ABSTRACT:

The system and method of the present invention comprises a compressed domain universal transcoder that transcodes a bit stream representing frames of data encoded according to a first compression standard (TDVC coding standard) to a bit stream representing frames of data according to a second compression standard (MELP coding standard). The method includes decoding a bit stream into a first set of parameters compatible with a first compression standard. Next, the first set of parameters are transformed into a second set of parameters compatible with a second compression standard without converting the first set of parameters to an analog or digital waveform representation. Lastly, the second set of parameters are encoded into a bit stream compatible with the second compression standard.

25 Claims, 13 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 12

CLAIMS:

What is claimed is:

1. A method for transcoding a bit stream encoded according to a time domain voicing cutoff (TDVC) standard to a bit stream encoded according to a mixed-excitation linear predictive (MELP) standard, comprising: decoding a bit stream into a first set of vocoder parameters compatible with the TDVC standard; transforming the first set of vocoder parameters into a second set

of vocoder parameters compatible with the MELP standard without converting the first set of vocoder parameters to an analog or digital waveform representation; and encoding the second set of vocoder parameters into a bit stream compatible with the MELP standard.

2. The method of claim 1, wherein the transforming includes converting TDVC spectrum, voicing, pitch, and gain parameters to MELP spectrum, voicing, pitch, and gain parameters.

3. The method of claim 2, wherein the converting of TDVC spectrum parameters to MELP spectrum parameters comprises: linearly interpolating 9 frames of TDVC line spectrum frequencies to form 8 frames of TDVC line spectrum frequencies; and scaling the interpolated TDVC line spectrum frequencies to generate MELP line specturm frequencies.

4. The method of claim 3, further comprising: encoding the MELP line spectrum frequencies according to the MELP standard.

5. The method of claim 2, further comprising: generating ten MELP harmonic amplitude values; and encoding the harmonic amplitude values according to the MELP standard.

6. The method of claim 2, wherein the converting of TDVC voicing parameters to MELP voicing parameters comprises: linearly interpolating 9 frames of TDVC voicing cutoff parameter (fsel) values to form 8 frames of TDVC voicing cutoff parameter values; and converting the interpolated fsel parameter to the MELP overall voicing bit and MELP bandpass voicing strengths.

7. The method of claim 6, wherein the converting of the interpolated fsel parameter comprises: setting all of the MELP bandpass voicing strengths below

the TDVC voicing cutoff frequency corresponding to fsel to be voiced.

8. The method of claim 7, further comprising: encoding the MELP overall voicing bit and the bandpass voicing strengths according to the MELP standard.

9. The method of claim 2, wherein the converting of TDVC pitch parameters to MELP pitch comprises: linearly interpolating 9 frames of TDVC pitch parameter values to form 8 frames of TDVC pitch parameter values; and taking the logarithm of the interpolated TDVC pitch parameter values to generate the MELP pitch parameter values.

10. The method of claim 9, further comprising: encoding the MELP pitch parameters according to the MELP standard.

11. The method of claim 2, wherein the converting of TDVC gain parameters to MELP gain parameters comprises: generating 2 half-frame MELP gains by logarithmically interpolating TDVC gain parameter values; and moving the interpolation weights slightly backward in the clock schedule for the first MELP half-frame gain and slightly forward in the clock schedule for the second MELP half-frame gain.

12. A method of claim 11, further comprising logarithmically encoding the two half-frame gains according to the MELP standard.

13. A transcoder for transcoding a bit stream encoded according to a TDVC standard to a bit stream encoded according to an MELP standard, comprising: a decoder decoding a bit stream into a first set of vocoder parameters compatible with the TDVC standard; a conversion unit transforming the frist set of vocoder parameters into a second set of vocoder parameters compatible with the

MELP standard without converting the first set of vocoder parameters to an analog or digital waveform representation; and an encoder encoding the second set of vocoder parameters into a bit stream compatible with the MELP vocoder standard.

14. The transcoder as recited in claim 13, wherein the conversion unit converts TDVC spectrum, voicing, pitch, and gain parameters to MELP spectrum, voicing, pitch, and gain parameters.

15. The transcoder as recited in claim 14, wherein the conversion unit converts TDVC spectrum parameters to MELP spectrum parameters by performing steps comprising: linearlly interpolating 9 frames of TDVC line spectrum frequencies to form 8 frames of TDVC line spectrum frequencies; and scaling the interpolated TDVC line spectrum frequencies to generate MELP line spectrum frequencies.

16. The transcoder as recited in claim 15, wherein the transcoder encodes the MELP line spectrum frequencies according to the MELP standard.

17. The transcoder as recited in claim 15, wherein the conversion unit converts TDVC spectrum parameters to MELP spectrum parameters by further performing the steps comprising: generating ten MELP harmonic amplitude values.

18. The transcoder as recited in claim 17, wherein the transcoder encodes the harmonic amplitude values according to the MELP standard.

19. The transcoder as recited in claim 14, wherein the conversion unit converts TDVC voicing parameters to MELP voicing parameters by performing the steps comprising: linearly interpolating 9 frames of TDVC

voicing cutoff
parameter (fsel) values to form 8 frames of TDVC voicing cutoff parameter
values; and converting the interpolated fsel parameter to the MELP overall
voicing bit and MELP bandpass voicing strengths.

20. The transcoder as recited in claim 19, wherein the step of converting
of the interpolated fsel parameter comprises: setting all of the MELP bandpass
voicing strengths below the TDVC voicing cutoff frequency corresponding to fsel
to be voiced.

21. The transcoder as recited in claim 20, wherein the transcoder encodes
the MELP overall voicing bit and the bandpass voicing strength according to the
MELP standard.

22. The transcoder as recited in claim 14, wherein the conversion unit
converts TDVC pitch parameters to MELP pitch parameters by performing the steps
comprising: linearly interpolating 9 frames of TDVC pitch parameter values to
form 8 frames of TDVC pitch parameter values; and taking the logarithm of the
interpolated TDVC pitch parameter values to generate the MELP pitch parameter
values.

23. The transcoder as recited in claim 22, wherein the transcoder encodes
the MELP pitch parameter according to the MELP standard.

24. The transcoder as recited in claim 14, wherein the conversion unit
converts TDVC gain parameters to MELP gain parameters by performing the steps
comprising: generating 2 half-frame MELP gains by logarithmically interpolating
TDVC gain parameter values; and moving the interpolation weights slightly
backward in the clock schedule for the first MELP half-frame gain and slightly
forward in the clock schedule for the second MELP

half-frame gain.

25. The transcoder as recited in claim 24, wherein the transcoder logarithmically encodes the two half-frame gains according to the MELP standard.